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COTTON PRODUCTION IN SOUTHERN BRAZIL

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Senior Marketing Specialist

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Washington, D. C.
May 1935
Revised September 1939

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COTTON PRODUCTION IN SOUTHERN BRAZIL 1/

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INTRODUCTION

Cotton is grown in two distinct districts of Brazil; the northeastern States and the southern States. In Southern Brazil cotton is second in importance to coffee as a cash crop, while in the northeastern States it is of first importance and in many sections of this area is the only cash crop grown. Not only are the economic conditions under which the crop is produced vastly different in the two areas, but the soil and climatic factors differ widely. The cotton grown is of two distinctly different types and qualities. Southern Brazil produces only American Upland cotton, while in the northeastern States the production is largely the famous Brazilian tree cotton.

Cotton was no doubt grown in Southern Brazil long before the arrival of the white man. Early settlers reported that Indians were using fabrics made from cotton, and as early as 1700 quite a quantity of raw cotton was exported from Sao Paulo. During the American Civil War, when European cotton spinners were cut off from American supplies, and immediately following the war, when prices were extraordinarily high, Brazilian cotton was an important item in the world's cotton trade. With the return to normal conditions in the United States, the Brazilian crop declined. Following the liberation of Brazilian slaves in 1888, cotton production declined further and in a few years became relatively unimportant. During the years between the American Civil War and the World War the development of the world's greatest coffee-growing area in Southern Brazil overshadowed the production of cotton. Conditions since the World War, however, have again favored the production of cotton in this area.

Between 1921-22 and 1925-26 Southern Brazil produced from 120,000 to 228,000 bales of cotton. Following this date, the crop declined until in 1931-32, when it reached 125,000 bales. Since 1931-32 it has increased rapidly, reaching 1,876,908 bales in 1938-39. An examination of the conditions under which cotton is grown in Southern Brazil and the outlook for future production are the objects of this report.

COTTON GROWING AREA

Cotton growing in Southern Brazil at present is confined to the area beyond the coastal range of mountains. Very little cotton is grown in the narrow coastal plain between the sea and the mountains. The interior region beyond the mountains, averaging about 2,500 feet in elevation, is the most important agricultural section of Brazil. It is a part of the great Brazilian Plateau, which extends the full length of the country from northeast to southwest. Practically all of this plateau within the State of Minas Geraes is drained by rivers flowing north; in Sao Paulo the drainage is to the west and south, and the extreme southern States drain eastward into the Atlantic Ocean. The topography of this area is rolling and broken in some places by low hills and mountains. The soil ranges from a sandy clay to a clay loam and in appearance resembles the Piedmont

1/ This report, based on a field investigation by the author, of the cotton-growing areas of Brazil was first issued in May 1935. Statistical data since 1933-34 have been included in the revised issue. For a report on Cotton Production in Northeast Brazil see F. S. 64 (Revised).

soils of the United States. The area along the western slope of the coastal mountain range is one of the oldest agricultural regions of Brazil. Here the early Portuguese settlers planted large coffee plantations and, when the soil became exhausted, gradually moved westward. Much of this country was abandoned a hundred years ago and is today grown up in forests or is used for grazing and livestock farming. It is a common practice in Brazil, when the land is exhausted from cropping, to move westward and take up new land. This has been going on for a hundred years or more and is in part responsible for the gradual westward movement of agriculture in Southern Brazil.

The total area of the four leading cotton producing States of Southern Brazil (Sao Paulo, Minas Geraes, Rio de Janeiro, and Parand) is approximately 418,000 square miles, or almost as large as the combined area of Arkansas, Louisiana, Oklahoma, and Texas. If the two extreme southern States of Rio Grande do Sul and Santa Catharina are included, the total area of Southern Brazil is 565,110 square miles, or about equal to the area of the American cotton belt west of the Mississippi River plus the States of Mississippi and Alabama. 2/ While much of this area is now producing coffee, corn, and other food crops, a large part of it is still in virgin forests and prairies, uninhabited and undeveloped. Large areas of Southern Brazil are in virgin timber, much of which, if cleared, would be suitable for the production of cotton, coffee, and food crops. The estimated area given over to farms, which includes land used for grazing and ranch purposes as well as the crop area, is less than 50 percent of the total area of this section. When the actual cultivated or crop-producing area is considered, the estimate is much less. In the two extreme southern States the percentage of unimproved land is higher than in the other four southern States. The land actually under cultivation perhaps does not exceed 10 percent of the total area. In the State of Minas Geraes there are also extensive areas now utilized only for grazing. It is obvious that Southern Brazil, from the standpoint of available land, has tremendous possibilities for agricultural expansion.

CLIMATE

The climate of the cotton belt of Southern Brazil on the whole is favorable to cotton production. With the exception of the two southern States, which at present grow little cotton, the temperature of Southern Brazil never drops to freezing; in fact, since records became available, killing frosts have occurred only once or twice. Sao Paulo, the leading cotton growing State, because of its elevation has very agreeable winters and comparatively cool summers. The cotton area of Minas Geraes, being nearer the equator, naturally has higher temperatures in both summer and winter. The rainfall of the area is divided into two seasons, wet and dry. While vegetation grows the year round, the fall and winter seasons, which occur during the North American spring and summer months, are much drier than the spring and summer months of September to February. During the growing

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2/ A small amount of cotton is grown in the southern part of Goyaz and Matto Grosso, but for the purpose of this study these States are not included in the cotton-growing area of Southern Brazil. The southern part of the State of Bahia is referred to by the Brazilian Government as a part of the southern area, but for the purposes of this study the entire State of Bahia will be considered as being in Northeast Brazil.

season rainfall averages about 6 inches per month. Low temperature has little influence on cotton production in this area, rainfall being the most important climatic factor. As a rule, cotton does not suffer from drought, but during some years the rains continue into the fall season, thus making picking difficult, and often resulting in a good deal of the crop being damaged or completely lost. Cotton is planted in September, October, and November, which are the spring months, and harvested in March, April, and May, the fall months.

TABLE 1 - Normal average rainfall by months at stations in the cotton belt of Southern Brazil

Month	Average of four stations		Month	Average of four stations	
	Sao Paulo	Minas Geraes		Sao Paulo	Minas Geraes
	Inches	Inches		Inches	Inches
January	11.34	11.57	July	1.21	.65
February	7.68	8.25	August	1.56	.90
March	5.88	7.62	September	2.67	2.23
April	2.45	3.36	October	4.64	5.29
May	1.68	1.17	November	6.20	8.32
June	2.46	1.27	December	7.90	9.76
			Total	55.67	60.39

Compiled from the Official Reports of the Brazilian Ministry of Agriculture, Rio de Janeiro.

TABLE 2 - Normal average maximum, minimum, and average temperatures by months at stations in the cotton belt of Southern Brazilian States

Month	Average for two stations					
	Sao Paulo			Parana		
	Maximum	Minimum	Average	Maximum	Minimum	Average
	Degrees F.	Degrees F.	Degrees F.	Degrees F.	Degrees F.	Degrees F.
January	83.8	64.5	72.7	82.0	61.6	73.9
February	84.6	64.2	72.7	81.7	61.6	70.2
March	82.7	63.8	71.7	80.6	60.0	69.4
April	80.5	60.4	69.0	77.9	55.5	65.8
May	76.9	55.0	64.1	71.8	49.3	59.6
June	74.2	50.8	60.9	67.6	46.8	56.6
July	74.0	48.7	59.8	68.9	44.6	55.8
August	76.2	51.4	62.6	71.6	46.4	58.0
September	78.4	55.4	66.2	73.2	50.1	61.4
October	79.2	58.2	67.6	76.0	53.6	64.5
November	82.0	60.0	70.0	79.4	56.2	67.4
December	82.8	62.6	71.8	82.8	59.7	70.6
Year	80.0	58.0	67.5	76.0	54.0	64.2

Compiled from the official Reports of the Brazilian Ministry of Agriculture, Rio de Janeiro.

POPULATION AND LABOR SUPPLY

The population of Brizil is estimated at 42,395,151. Approximately half of these people live in Southern Brazil, and 80 percent of Southern Brazil's population live in the States of Rio de Janeiro, Sao Paulo, Minas Geraes, and Paraná, the chief cotton-growing States. Minas Geraes has an estimated population of 7,706,847, Sao Paulo 6,796,062, and Rio de Janeiro, exclusive of the Federal District (city of Rio de Janeiro), 2,074,192 people.

TABLE 3 - Population and area of Southern Brazil by States, 1937

State	Population	Area
	Number	Square miles
Rio Grande do Sul	3,119,211	110,140
Santa Catharina	1,012,424	36,679
Paraná	1,040,919	77,180
Sao Paulo	6,796,062	95,459
Minas Geraes	7,706,847	229,270
Rio de Janeiro	2,074,192	16,372
Total	21,749,655	565,110

Compiled from Brazil 1937, Brazilian Ministry of Foreign Affairs, Rio de Janeiro.

Rio de Janeiro is the most densely populated State, followed by Sao Paulo and Minas Geraes. The sparsely settled State of Paraná had only a few more than one million population, while the two most southern States have a combined population of more than four million. The people are largely Portuguese, or of Portuguese stock. There is, however, quite a mixture of native Indian and Negro blood. The Negroes were originally slaves. Portuguese language, customs, and traditions predominate.

Immigration into Southern Brazil has been heavy in past years. Large numbers of Italians, Spaniards, Portuguese, Germans, and Japanese have settled in the southern States. The Germans have settled largely in Rio Grande do Sul and Santa Catharina, while the Italians, Portuguese, and Japanese have settled in the State of Sao Paulo. Several large colonization syndicates have been organized by various foreign interests during the last 20 years but with only fair success. The most successful, however, are those formed by the Japanese. Some of the colonization schemes were originally planned for the purpose of growing cotton, but because of the lack of transportation, low cotton prices, and the demand for labor on the coffee plantations, they were not entirely successful. Most of these companies are now engaged in a land-sales business rather than in actual operation of cotton plantations. Much of the agricultural labor necessary to produce and harvest the coffee crop of this area is supplied by immigrants. The Europeans, especially Italians, Portuguese, and Spaniards, seem to be satisfied to work as laborers on the large coffee plantations, while the Japanese prefer to buy their own land. Within a short time after arrival practically all Japanese settlers become landowners.

In the past Brazil has encouraged immigration, but in recent years a feeling that immigration should be restricted or selected has developed. The constitution adopted in 1934 provides for a restriction of immigration. While some effort is being made to limit certain classes of immigration, it is clear that there is a shortage of labor in relation to the enormous undeveloped area. While there are several large cities in Southern Brazil where industry has developed rapidly, the area is largely agricultural.

PHYSICAL FACILITIES FOR HANDLING COTTON

Transportation facilities in Sao Paulo, in southern Minas Geraes, and in the State of Rio de Janeiro are the best to be found in Brazil. While but little more than 10 percent of the total area of the Republic, these States contain approximately 55 percent of the country's railroad mileage. The present agricultural districts have fair transportation facilities, but there are still large, sparsely populated areas in which transportation is a major problem. This is particularly true of Paraná, western Sao Paulo, and northern Minas Geraes. Cotton production, like other agricultural development, has followed the lines of railroads, and until highways or railroads are built into the new areas, much of the land will remain undeveloped. The bulk of the cotton crop of Southern Brazil is produced within the districts where transportation facilities are good.

The number of cotton gins in Southern Brazil has practically doubled in recent years. In 1934 about 240 gins were reported in the State of Sao Paulo; 3/ today it is estimated that there are more than 400 ginning plants in this State. Many of the gins of a few years ago were old and in poor repair. Today the gins of this area are as a rule modern, up-to-date plants, although they are on an average smaller than the gins of the United States. It is estimated that about half of them are one- and two-stand plants. A few years ago, the scarcity of gins was apparent, but the increased number and the extended ginning season have to a degree overcome the shortage of ginning plants. Many plants operate from 4 to 8 months a year, most of the time on a 24-hour basis.

Imports of American-made ginning equipment have been relatively large in recent years. The expansion of cotton acreage since 1930 and the Government requirement that all gins be in good repair have resulted in a system of gins far superior to the gins of a few years ago. A good deal of the gin machinery imported has been used as replacements for the old and worn-out plants closed by Government regulation. Many old plants have been completely rebuilt. Most of the gins are of American manufacture, although some locally made equipment is in use.

Several years ago the Government adopted a system of control of the cotton trade. Gins are now inspected and licensed by the Government, and a Government agent is stationed at the gin with instructions to see that the plant is properly operated and to draw an official sample of cotton for Government classification from each bale ginned. This state control is largely responsible for the improvement made in ginning equipment and the improved ginning of recent years.

3/ Economical Aspects of Brazilian Cotton Cultivation. Publication No. 4, Directory of Textile Plants, Brazilian Ministry of Agriculture, Rio de Janeiro.

The present south Brazilian cotton bale is about 42 x 20 x 30 inches and weighs about 400 pounds. The tare averages about 8.5 pounds per bale. In recent years the use of cotton bagging has increased, and it is expected that its use will soon be compulsory in the State of Sao Paulo.

The Sao Paulo cotton bale is pressed at the gin to a density of about 22 to 33 pounds per cubic foot. A few of the gins are equipped to press a bale to a density of up to 40 pounds per cubic foot in one operation. It is estimated that about 75 percent of the export bales are repressed at Sao Paulo and about 25 percent are shipped abroad at the gin-pressed density of 22 to 33 pounds per cubic foot.

Southern Brazil has a number of local cottonseed-oil mills and presses.

COTTON PRODUCTION, ACREAGE, AND YIELDS

The Brazilian cotton crop during the past 15 years has averaged annually approximately 976,000 bales of 478 pounds. Of this, the southern States have produced an average annual crop of about 442,000 bales, or 45 percent of the country's total. For the 5-year period from 1924-25 to 1928-29 the average annual crop was 538,000 bales, of which 17 percent, or about 94,000 bales, was grown in the southern States. During the next 5-year period ended 1933-34 the country's total crop increased to an annual average of 621,000 bales, while the average of the southern States increased to 203,000 bales, or about one-third of the total Brazilian crop. Since 1933-34 both the average crop of the country and that of the southern States have increased rapidly. The 5-year average from 1934-35 to date was 1,772,000 bales for the whole country, while the average of the southern States during this period was 1,011,000 bales, or 57 percent of the total for the country.

From a crop of 545,186 bales in 1934-35 the southern States increased until in 1938-39 a crop estimated at 1,226,136 bales, or 65 percent of the total crop, was harvested. The 1935-36 crop was 931,217 bales, while the 1936-37 crop was 1,138,358 bales and the 1937-38 crop was 1,330,232 bales. The increase of the last 5 years as compared with the previous 5-year period is outstanding.

Of the cotton growing States of Southern Brazil, Sao Paulo is by far the most important. Minas Geraes, Rio de Janeiro, and Paraná grow cotton, but at no time has the total of these States equaled that of Sao Paulo. The fluctuations of cotton production in Southern Brazil are due largely to increases or decreases in the State of Sao Paulo. During the past 15 years, production in the southern States other than Sao Paulo has increased, but the total crop of Southern Brazil has followed the fluctuations in Sao Paulo. On the whole, States other than Sao Paulo produced but a small percentage of the southern States' total. Next to Sao Paulo, Minas Geraes is the most important. Rio de Janeiro and Paraná are not important cotton-growing States and only in the past few years have attracted enough attention to be included in the official estimates. A small amount of cotton is grown in the States of Santa Catharina and Rio Grande do Sul. In recent years cotton has been reported in the southern part of Goyaz and Matto Grosso, but at present the crop of these States is of little importance. The recent increase in the southern States is largely the reflection of the increase in the State of Sao Paulo.

TABLE 4 - Cotton acreage and production in Southern Brazil and total, 1924-25 to 1938-39

Season	All Brazil		Southern Brazil a/	
	Acreage	Production b/	Acreage	Production b/
	Acres	Bales	Acres	Bales
1924-25	1,911,877	739,533	456,404	174,814
1925-26	1,542,233	560,734	322,426	114,588
1926-27	1,422,014	493,415	183,153	62,259
1927-28	1,376,102	463,939	179,893	73,739
1928-29	1,393,335	430,081	170,195	45,277
1929-30	1,725,613	571,038	155,236	52,666
1930-31	1,694,001	483,347	287,229	81,201
1931-32	1,999,936	555,259	358,246	126,377
1932-33	1,702,571	480,709	524,939	222,065
1933-34	2,850,647	1,013,655	1,138,667	530,377
1934-35	3,930,588	1,328,345	1,477,465	545,186
1935-36	5,053,758	1,757,246	2,514,022	931,217
1936-37	5,220,319	1,824,099	3,096,833	1,138,358
1937-38 c/	6,010,201	2,074,727	3,525,398	1,330,232
1938-39 c/		d/1,876,908		e/1,226,136

Compiled from official reports of the Brazilian Ministry of Agriculture.
a/ Excludes State of Bahia. b/ In bales of 478 pounds net. c/ Preliminary.
d/ Third estimate Northern Brazil includes only northern zone of Bahia.
e/ First estimate Southern Brazil includes southern zone of Bahia.

The 1929-30 crop of Sao Paulo was 18,100 bales, or 34 percent of the southern crop, while 4 years later (1933-34) it was 471,803 bales, or 89 percent of the total crop. Since 1934-35 more than 80 percent of all the cotton of Southern Brazil has been grown in Sao Paulo.

TABLE 5 - Cotton acreage and production in Sao Paulo and in all other southern States, 1924-25 to 1938-39

Season	Sao Paulo		All other southern States	
	Acreage	Production a/	Acreage	Production a/
	Acres	Bales	Acres	Bales
1924-25	337,712	124,186	118,692	50,628
1925-26	235,857	76,137	86,569	38,451
1926-27	130,288	39,867	52,865	22,392
1927-28	104,770	46,015	75,123	27,724
1928-29	92,489	20,455	77,706	24,822
1929-30	52,227	18,144	103,009	34,522
1930-31	148,260	48,427	138,969	32,774
1931-32	228,091	98,035	130,155	28,342
1932-33	299,379	160,262	225,560	61,803
1933-34	971,830	471,803	166,837	58,574
1934-35	1,201,331	452,944	276,134	92,242
1935-36	2,152,204	815,471	361,818	115,746
1936-37	2,430,434	934,501	666,399	203,857
1937-38	2,921,614	1,145,174	603,784	185,058
1938-39 b/		c/1,129,973		d/ 96,163

Compiled from official reports of the Brazilian Ministry of Agriculture.
a/ In bales of 478 pounds net. b/ Preliminary. c/ First official estimate. d/ Includes southern zone of Bahia.

During the period for which acreage data are available the total cotton area of all Brazil has exceeded 6,000,000 acres only once. The average acreage for the 10-year period ended 1933-34 was 1,761,833 acres. The average acreage for the first 5 years of this period was 1,529,112 acres, while for the 5-year period ended 1933-34 it averaged 1,994,554 acres. Following 1933-34 the cotton acreage of the country as a whole rose rapidly. The 1934-35 acreage was 3,980,588, an increase of more than a million acres over the 1933-34 acreage. In 1935-36 it reached 5,053,758 acres, and 5,220,319 acres in 1936-37. During the last year for which estimates are available, 1937-38, the cotton acreage was 6,010,201.

Cotton acreage of the southern States has fluctuated widely in the last 10 years. From 456,404 acres in 1924-25 cotton plantings in these States declined to 155,236 acres in 1929-30, but since that year have increased until a record area of 3,525,398 acres was reached in 1937-38. The average for the 5-year period 1924-25 to 1928-29 of 262,414 acres was due largely to heavy plantings in 1924-25 and 1925-26. The last 3 years of this 5-year period, acreage ranged from 170,195 to 183,153 acres. During the entire 5-year period ended 1928-29 the southern States planted only 17.2 percent of the total cotton area of Brazil.

Following the low acreage of 1929-30, cotton planting in the southern States has increased rapidly. The 1929-30 acreage was less than 10 percent of the total acreage of Brazil, while the record acreage of 1937-38 was more than 50 percent of the total cotton acreage. The annual plantings of the southern States for the 5-year period ended 1933-34 was 24.7 percent of the total Brazilian cotton acreage.

During the 15 years since 1924-25 the cotton acreage of Sao Paulo has fluctuated between 52,227 acres in 1929-30 and 2,921,614 acres in 1937-38. For the 5 years ended 1928-29 Sao Paulo averaged 70 percent of all southern cotton acreage, while for the 5-year period ended 1933-34 the average was about 69 percent. Since that date, however, the Sao Paulo acreage has averaged more than 80 percent of the total southern cotton acreage.

Cotton yields of Southern Brazil from 1924-25 to 1937-38, which is the last year of available data, have averaged 180.3 pounds per acre. The average for the entire country was 161.2 pounds per acre. The average for the State of Sao Paulo during this period was 188.2 pounds per acre. The southern States' yields, on the average, show a wider fluctuation than those of the country as a whole.

In the State of Sao Paulo yields have fluctuated more than the average for the southern States or the country at large. It is noticeable of Southern Brazil and especially of Sao Paulo that low yields are often associated with low acreage. The explanation is no doubt found in the fact that growers, during periods of unfavorable cotton conditions, not only plant less cotton but give less attention to the cultivation of the land planted, the reason being that they employ their time to better advantage in other crops.

Rainfall is an important factor in yields in Southern Brazil. Although yields are seldom affected by dry weather, excessive rainfall during the harvest season may reduce the crop. Heavy rains occurring during March, April, May,

and June interfere with picking and as a result the harvest may be delayed. Because cotton and coffee harvest periods occur at about the same time, rainy weather at this season may make it necessary to use all available labor in harvesting the coffee crop during the days of sunshine. Under such conditions cotton is often sacrificed in order to harvest the coffee. During such periods a part of the cotton may never be picked and as a result average yields are reduced.

Yields are also affected by insects, chief of which is the pink boll worm. The damage from this insect varies from year to year, and is a factor in the annual fluctuations of yields. Plant diseases and other pests are also prevalent. As cotton becomes more widespread, the damage from insects and diseases may be expected to increase. This, however, is offset to some extent by a vigorous policy of control on the part of the Government. The problem of control of insects and diseases in a semi-tropical area the size of Southern Brazil, where the climate is humid and vegetation grows the year round, is not a simple matter.

There is little or no commercial fertilizer used at present. With large areas of undeveloped land available, it appears to the farmers of Brazil to be more economical to clear new land than to use commercial fertilizer, practice crop rotations, or grow soil-building crops. This practice of exploiting the land is followed with respect to coffee production and is characteristic of farming in a new country.

TABLE 6 - Average yield of cotton in Brazil, the southern States, and Sao Paulo, 1924-25 to 1937-38

Season	Brazil	Southern States	Sao Paulo
	Pounds per acre	Pounds per acre	Pounds per acre
1924-25	185	183	176
1925-26	174	170	154
1926-27	166	162	146
1927-28	161	196	210
1928-29	148	127	106
1929-30	158	162	166
1930-31	136	135	156
1931-32	133	169	205
1932-33	135	202	256
1933-34	170	223	232
1934-35	160	176	180
1935-36	166	177	181
1936-37	167	176	184
1937-38 a/	165	180	187

Compiled from official reports of the Brazilian Ministry of Agriculture.
a/ Preliminary.

QUALITY OF COTTON GROWN

The cotton grown in Southern Brazil is of American Upland origin. Most of the leading varieties were selected from Texas seed. While the varieties grown outside Sao Paulo may equal American cotton in staple length, some of them appear to be lacking in the factors generally included in the term "character," such as strength, uniformity, fineness, and freedom from fiber imperfections. Reports of shipments to Europe and other cotton manufacturing centers indicate a wide variation in quality; this lack of uniformity, however, has improved in recent years, and never was so common of Southern Brazil as of the northeastern cotton.

The quality of cotton produced in Sao Paulo has been improved during recent years by a system of gin inspections and classification service provided by the Federal and State Governments and by the State control of seed distribution. The improvement in staple length in this State has been noticeable. By controlling the seed supply and allowing only approved varieties to be planted, the average staple length of the Sao Paulo crop has been increased from 15/16 inch to over an inch within the past few years. The improvement in both the grade and staple has been a factor in the increased use of Southern Brazilian cotton in the local mills. 4/

The agricultural experiment station of Sao Paulo has developed varieties of cotton well adapted to local conditions. These varieties are heavy yielders, fairly uniform in staple length, and otherwise superior to the common cotton growth. Much of the improvement in the staple length of the cotton of the State is due to the wide distribution of these new locally developed varieties. The work of the Sao Paulo station located at Campinas is outstanding among the Brazilian agricultural experiment stations.

CONSUMPTION AND EXPORTS

The cotton-textile industry of Brazil has increased rapidly during the past 15 years and is today the leading industry of the country. The number of spindles in operation in 1936 was estimated at 2,532,342, located in 338 mills, employing 125,000 people. The bulk, or 263, of these mills are located in Southern Brazil. This section of the country also has 1,946,272 spindles and 87,000 people engaged in cotton-mill work.

Brazilian cotton mills now produce from 90 to 95 percent of the country's cotton-textile requirements. Only the goods made from the highest-count yarns are imported. As the spinning industry of Southern Brazil developed, the use of local cotton increased. Mills of Sao Paulo, Rio de Janeiro, and Minas Geraes are using increasing amounts of locally grown cotton.

Under the Brazilian Union each State has the right to impose a tariff or import duty on imports from other States. Some of the States have a tariff on raw cotton and are thus requiring mills located within the State to use local cotton. In addition to the State tariff, there is a Federal tariff

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4/ The staple of Brazilian cotton is expressed in millimeters. The staple length as used was converted on the basis of 25.4 millimeters = one inch.

on all foreign cotton. At present this duty is so high that little or no foreign cotton enters the country. The local textile industry is also protected by a high tariff on finished goods and yarns. It is estimated that the present output of local mills of the southern States offers a market for from 300,000 to 400,000 bales of cotton annually.

On the average prior to 1934, Brazil exported about 10 to 15 percent of the annual cotton crop, most of which was from northeast Brazil. The southern States consumed most of their production, but with the increased production of recent years these States have become the chief export area. With the rapid increase of production in 1934 the southern States exported 290,039 bales, or almost 50 percent of the total exports of the country. By 1936, exports reached 612,740 bales, or 66 percent of the total Brazilian exports, and by 1938 were almost a million bales, or 75 percent of the total exports. During this period the State of Sao Paulo exported more than 99 percent of the southern States' total. Exports from Sao Paulo since 1934 have ranged from more than 40 percent to almost 75 percent of the total cotton exports of Brazil.

TABLE 7 - Cotton exports from Brazil and the southern States of Brazil and Sao Paulo, 1924 to 1933 a/

Year	Brazil	Southern States	Sao Paulo
	Bales	Bales	Bales
1924	29,815	4,222	2,743
1925	141,294	46,408	43,676
1926	76,963	2,243	1,587
1927	54,961	4,513	2,939
1928	46,167	34	5
1929	224,739	17,384	17,092
1930	140,282	299	261
1931	95,835	458	297
1932	2,377	---	---
1933	53,928	8,582	2,893
1934	583,654	290,039	289,047
1935	639,379	266,789	262,486
1936	923,873	612,740	610,762
1937 b/	1,089,298	705,454	702,539
1938 b/	1,239,368	924,599	922,030

Compiled from official reports of the Brazilian Ministry of Agriculture.
a/ In bales of 478 pounds net. b/ Preliminary.

By the control of foreign exchange and barter agreements the Government has at various times during the past years encouraged the sale of Brazilian cotton abroad. Some of the measures used by the Government have resulted in a greater relative return to exporters of cotton than to exporters of other commodities.

There is a strong feeling, especially in the State of Sao Paulo, that present conditions are favorable to the development of a permanent export cotton market. Local newspapers publish editorials and stories of sales of cotton abroad as well as accounts of local planters and farmers who have made large

sums from cotton. It is also pointed out that, while coffee is the leading export crop, it is well to develop a second major crop and that cotton is ideal for this purpose.

Such a movement is gaining the support of the citizenry. Mass education is perhaps higher in Sao Paulo than in any other section of the country, and this, with the local political conditions, makes it possible to develop an interest in such a program. Local citizens who take pride in the development of the State are being encouraged to invest capital in cotton gins and other equipment, while large planters are encouraged to turn to cotton or finance small growers who wish to produce cotton. The full force of this movement is not easy to estimate, but it is, nevertheless, a factor in the development of the industry in Southern Brazil.

MARKETING AND FINANCING

Most of the Brazilian cotton is sold in the seed. The ginner is the chief buyer and as a result large primary markets have grown up at local ginning centers. During the early years of the present period of expansion, many of the gins were small and not financially able to carry large stocks of ginned or unginned cotton and consequently disposed of the cotton as fast as possible. But in recent years, a system of credit has developed and the gins have been enlarged until many gins handle large enough volume of cotton to enable them to deal directly with large merchants. Some of the larger export merchants have also gone into the gin business, buying the seed cotton from the grower, ginning and exporting it within the same organization.

The crop is grown, sold, ginned, transported, handled, and exported under Government regulations. Only Government approved seed is planted. A Government inspector is located at the gin. The cotton is classed by Government classers. Transportation rates are fixed by Government regulations in many cases. The bale has veen standardized as to weight, size, density, and tare. All local as well as export sales are to a large degree regulated by law. In recent years Southern Brazilian cotton bales have made a favorable impression in foreign spinning markets.

One of the principal factors in limiting the expansion of cotton in Southern Brazil is the lack of capital available to the small farmer. While it is a common practice to borrow money for the production of coffee and the system of pledging coffee or coffee trees as collateral is well established, there is no well-developed system of financing cotton production. Such credit as is extended is usually provided by the owners or operators of the gins or by the buyers of cotton who deal directly with farmers. There is at present a tendency, however, for large financial organizations to rediscount the loans of the ginners, thus enabling them to extend credit to a larger number of growers as well as to prospective growers. There is perhaps no factor, aside from price, that will stimulate production as rapidly as an extension of credit to farmers who are now producing little or no cotton.

COTTON vs. COFFEE

No statement on Brazilian cotton production is complete without a reference to coffee and its influence upon cotton. Coffee is the most important cash crop grown in Brazil. Brazil produces the bulk of the world's coffee crop, and fully 80 percent of the Brazilian crop is produced in the three States of Sao Paulo, Rio de Janeiro, and Minas Geraes, of which Sao Paulo is by far the most important. The history of coffee production is one of a rapidly expanding industry enjoying, until recent years, almost a monopoly of the world's market. Practically every industry is affected by the rise or fall of coffee prices, as the whole economic structure of the country has been built around the income from coffee. During the past hundred years the coffee-growing belt has pushed farther and farther west. Enormous areas have been cleared and planted to coffee trees and millions of people have been employed in cultivating and gathering the crop. Coffee has served as a basis of agricultural credit and is the most important export commodity.

The early settlers developed with slave labor large coffee plantations. After the slaves were liberated, immigrants, largely from southern Europe, settled in the country, and as a result the plantations are now worked largely by white labor. Because of the cheap land, the old coffee plantations were abandoned as the soil became exhausted and new areas were planted. An example of this is found along the west slopes of the coastal mountain range in the States of Rio de Janeiro and Sao Paulo. A hundred years ago these mountain slopes were the chief coffee-growing districts, but as the land became exhausted the plantations were abandoned and new lands were taken up on the rolling plateau to the west. The increasing demand for coffee has brought about a steady movement of agriculture to the west. These old, abandoned plantations have, in most cases, reverted to the native grasses and are now used for grazing and livestock farming.

A coffee plantation is often a complete community within itself. It may consist of thousands of acres, a part of which is in virgin forests. When many of the plantations were first settled 75 to 100 years ago, they included enormous areas far in excess of any immediate need. It was a common practice for a plantation owner who had made a fortune in the mountain-slope districts of the coastal range but whose land had become exhausted, to move farther west and stake out a plantation many times the size of his old holdings in the mountains. This accounts for the large areas in these plantations, many of which have since been subdivided several times but still contain great areas of virgin land. A present-day coffee plantation may have from a few to several hundred families engaged in cultivating and caring for the trees. These people live in villages on the land and draw their supplies from the plantation commissary. They may also grow a small acreage of food crops, principally corn, beans, rice, and manioc, for home use. During the coffee-growing season each family has a certain number of trees to cultivate and care for. The labor required to keep the coffee land clean is not as great as at the harvest season. An average family can care for more trees during the cultivating season than they can pick at harvest season. If a plantation owner utilizes all his available labor during the growing season cultivating the trees, he will therefore be short of labor at harvest time. To relieve this situation many plantation owners depend upon the labor of small independent farmers who live nearby and

who are willing to pick coffee during the harvesting season. Extra labor is sometimes obtained from the towns and cities. Many people living in towns are willing to work on the plantations during the coffee-harvest season but prefer to spend the remainder of the year in town.

Once land is planted to coffee, the trees are seldom uprooted and other crops planted in their place. As a rule, coffee trees stand until the soil fertility is exhausted. The coffee tree is a perennial and comes into full production when about 5 or 6 years of age and may continue to produce for from 30 to 50 years. There are coffee trees in Sao Paulo 100 years old. While the expansion of coffee has been rapid, there are still large undeveloped areas in Southern Brazil capable of producing coffee, cotton, and other crops. The question of suitable land is not, therefore, a serious factor in the expansion of either coffee or cotton in Southern Brazil.

Since 1930 there has been a restriction on the planting of coffee and many planters who would under normal conditions have planted new land to coffee trees have planted their new land to cotton. It is a common practice on many coffee plantations to clear and prepare a fixed amount of land each year for planting new coffee trees, but, with the restriction on planting, much of the newly prepared land has been planted to cotton. Should coffee prices rise and the restriction on coffee planting be removed, it is likely that planters will to some extent discontinue cotton on newly cleared areas and plant coffee as originally planned. The outlook for a rise in coffee prices, however, is not very bright at this time.

Southern Brazil, with a total of 21,749,000 people, 50 percent or more of whom live in towns and cities, has always been short of farm labor. The labor problem has been, and is becoming more and more, acute as the industries of the cities and towns develop. Plantation owners are constantly faced with the threat of strikes and other labor trouble during the harvest season. The peak of labor requirements of both coffee and cotton occur at about the same season of the year, that is, during the harvest from March to June. Most planters have sufficient labor to cultivate coffee or cotton, but as both of these crops require a great deal of hand labor during the harvest season, few planters have sufficient labor to harvest large crops of both. The family of the small farmer living nearby provides much of the extra labor required by the coffee planter at harvest season. As a rule, these small independent farmers depend upon the wages of their families as coffee pickers during the coffee-harvest season for the family cash income. This, in addition to the food they produce on their own land, constitutes their total annual income. During years of high coffee prices, planters were able to pay rather attractive wages at harvest season, but during periods of low coffee prices, such as have existed since 1931, the wages of coffee pickers have been low and a good many of these small independent farmers have discovered that they can make more money growing and picking cotton than as laborers on the coffee plantations. They therefore plant cotton following a period of low coffee wages. Coffee planters are, therefore, using more laborers from the cities and towns during the coffee-harvest season.

A preliminary study of data available for the State of Sao Paulo indicates that the average planted to cotton is influenced by the ratio of cotton prices to coffee prices. Cotton acreage has tended to increase following

seasons during which coffee prices were low as compared with cotton prices and conversely, cotton acreage has tended to decrease following seasons during which coffee prices were high relative to cotton prices. For example, in 1924 the average March to June price of cotton was 235.6 percent of the average March to June price of coffee and the cotton acreage planted the following September was 337,712 acres. One year later the ratio between the prices of the two crops had changed so that the price of cotton was 117.5 percent of the coffee price and the acreage of cotton declined more than 100,000 acres. The ratio of prices in 1926 was slightly more than 100 percent and the cotton acreage declined to 130,288 acres. The 1933 ratio of cotton prices to coffee prices was 242.6 percent and the cotton acreage was almost a million acres.

While the ratio of cotton prices to coffee prices is not wholly responsible for the cotton acreage fluctuations, there is no doubt that it was an important factor. The fact that the coffee acreage from 1924 to 1930 was expanding rapidly and that many coffee planters could grow cotton along with new coffee plantings influenced cotton acreage regardless of cotton prices during this period. Since 1930 the planting of coffee trees has been prohibited by law and many planters have turned to cotton and are now utilizing land for cotton production that would otherwise have been planted to coffee. Many of the large coffee planters, where they can obtain the labor, are turning to the production of cotton, not because they are giving up coffee but because cotton offers an opportunity for supplementing their reduced coffee income.

For a number of years prior to 1924 when coffee prices were relatively high, the acreage of coffee increased rapidly and, while cotton could have been grown between the rows of the young trees, planters apparently did not follow the practice to the same extent as during later periods of low coffee prices. In 1924, however, coffee prices began to decline. The fact that cotton may be grown on land occupied by young coffee trees at the discretion of the planter made it possible for planters to grow cotton in 1925 on an area in excess of the acreage that normally would have been expected. The 1933 cotton acreage was no doubt the result of an accumulation of considerable land cleaned with the intention of planting to coffee, but because the planting of coffee trees was prohibited by law a large part of this area was planted to cotton, thus bringing about a cotton acreage in excess of that indicated by the price relationship. The 1933 cotton crop was also the result of an accumulative interest in cotton. Brazilian coffee plantation owners have in the past preferred to grow coffee. Their entire plantations have been organized for the production of coffee, their labor trained in its cultivation and harvesting, and their credit based upon coffee as security. But when the price relation between coffee and cotton is such that the returns from cotton are in excess of those from coffee, many planters transfer a part of their effort to the production of cotton.

Small farmers living near large coffee plantations during periods of low coffee prices, which are reflected to the independent farmer in the form of low wages, also engage in the production of cotton. Thus the price of coffee, the wages of coffee laborers, and the price of cotton all influence the acreage of cotton in Southern Brazil.

TABLE 8 - Average seasonal price of cotton and coffee, the ratio of cotton prices, and the cotton acreage planted in Sao Paulo, 1924 to 1938

Year	Average price of Cotton March-June	Average price of Coffee March-June	Ratio of cotton prices to coffee prices	Cotton acreage planted September-November
	Cents per pound	Cents per pound	Percent	Acres
1924.....	33.25	14.11	235.6	337,712
1925.....	22.18	18.88	117.5	235,857
1926.....	17.55	17.48	100.4	130,288
1927.....	17.17	13.42	127.9	104,770
1928.....	22.18	19.62	113.0	92,489
1929.....	19.14	19.41	98.6	52,227
1930.....	a/ 16.24	11.07	146.7	148,260
1931.....	8.62	5.74	150.2	228,091
1932.....	9.10	4.80	189.6	299,379
1933.....	11.74	4.84	242.6	971,830
1934.....	11.46	6.78	169.0	1,201,331
1935.....	13.57	4.91	276.4	2,152,204
1936.....	11.57	5.04	229.6	2,430,434
1937.....	13.48	7.50	179.7	2,921,614
1938.....	8.64	5.05	171.1	b/

Compiled from the reports of the Sao Paulo Merchandise Exchange, Sao Paulo, Brazil, and the official reports of the Ministry of Agriculture, Rio de Janeiro, Brazil.

a/ Average of 2 months (March and April). b/ Not yet available.

OUTLOOK FOR COTTON PRODUCTION

A limiting factor in the expansion of cotton production in this area is the shortage of farm laborers and the low efficiency of the average worker. The use of farm machinery, either horse-drawn or motor-driven, for the cultivation of cotton is being tried by several of the larger plantation owners as well as by a number of the small independent farmers. While the application of machinery to cotton production is not universal and some growers still continue to use hand tools, there is the possibility of at least minimizing the labor shortage through the increased use of machinery. The present attitude toward immigration promises little in the way of increased workers. While large areas of land are available, much of it is still in forests and must be cleared before it can be brought under cultivation. The labor required to clear new land, while in some cases not great, is nevertheless a problem. In the event the present labor shortage is partially overcome by the wider use of farm machinery in cultivating cotton, there will still remain the problem of obtaining labor at the harvest season, especially if coffee wages are attractive.

In addition to the labor problem, there is in most of the cotton growing areas of Southern Brazil a shortage of ginning machinery. The gins have in the past been unable to handle the crop as harvested. Many run 6 to 8 months a year. Unless the ginning equipment is increased, this shortage will tend to retard expansion. Closely related to the ginning problem is the development of a better credit system for the purpose of making loans to growers and for the

marketing and handling of the crop. There appears to be ample capital in the country for this, however, and should the number of gins be increased and a system of production credit be established, this within itself would tend to act as a stabilizing influence on cotton acreage during periods of unfavorable conditions. As the physical and financial facilities for handling the cotton crop become well established, it is less likely that the acreage will undergo wide annual fluctuations.

The most important short-time factor contributing to an increase of cotton acreage is price, or the relationship between the price of cotton and other crops. Farm labor is used for the production of the crop that appears to give the greater returns. Labor will therefore choose the crop that pays better. Because it is limited, it is in a position to choose. In view of the present outlook, cotton may, for the next few years at least, offer the greater returns.

The influence of the local textile industry in Sao Paulo, Rio de Janeiro, and Minas Geraes will not only stimulate production but will also act as a stabilizing influence in this section. The desire of the Government to increase the value of the country's exports will tend to encourage the production of cotton in excess of the local requirements.

It would be reasonable to expect Southern Brazil to continue to produce sufficient cotton to satisfy the requirements of the local textile industry, about 300,000 to 400,000 bales annually. How much more will be produced for export will depend to a considerable extent upon the price relationship between cotton and other crops. Upon the whole, however, in view of the large potential cotton-growing area, it seems likely that production will remain at a high level for several years.

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